Another possibility for nuclear defense is the isolation and use of Xenon-135-- a product of the Uranium-235 fission process that takes place in nuclear reactors. As a neutron absorber that often cools down nuclear reactors by absorbing the extra neutrons, Xenon-135's use in laser defense technology could poison the nuclear reaction of any atomic missiles that it comes in contact with. Through diffusion, the Xenon-135 gas could penetrate the missile. Theoretically at a high enough temperature and pressure, a Xenon-135 powered laser beam in contact with the target would(at the very least--keeping in mind that high powered laser beams destroy missiles) diffuse into the external components of the target and infect the fission elements within and thus reduce the chances of a proper nuclear fission reaction taking place when the missile eventually detonates.

Subterranean Warfare

In building upon this thesis concerning the 2 sides of health, I offer an explanation that would further expound on how there must be an opposing or offsetting effect to everything. We will look at the opposing effect between air power and subterranean power. Throughout the history of warfare, subterranean structures have been used against enemy forces with great success. Back during the Arab invasions in the 7th century, monks found that they could successfully evade Arab forces by hiding underground. Back in WWII, the Japanese were effective in building underground fortification against US air power, and so were the Chinese, who built underground fortifications against Japanese air power. The Vietnamese during the Vietnam war was possibly the best example of how effective underground fortifications are against a superior air force. Many of the larger military powers, have had no formidable answer for this type of defense, even against small pockets of militants. The current conflict in the Middle East(2002-2021 as of now) is marred by the continued survival of these insurgent militant groups. Major powers like Russia and the United States have carried out a number of aerial attacks against them in recent years, but only with enough success to weaken the threat, not totally eliminate it. In recent years, Israel has faced numerous problems with the underground operations of Hamas, the militant group that controls the Gaza strip. Not only for smuggling resources into Gaza, the tunnels used by Hamas has allowed them to, at one point, ambush and kidnap an Israeli soldier

from Israeli territory. Hamas is also able to conceal ballistic fire locations with the use of the tunnels, making it more difficult for Israel to locate and destroy them. This underground methodology is also how ISIS, the Al Qaeda offshoot terror organization, continues to launch ambush attacks against Syrian regime soldiers, even after years of being bombarded by both US and Russian airstrikes. The operations of Hamas and ISIS and their continued survival in small numbers is setting the stage for a new type of warfare: Subterranean warfare. It's obvious that the larger powers have no real answer on how to battle effectively against underground forces, other then planting explosives at the entry or exit points or using aerial bombers to drop deep penetrating missiles into tunnel locations. This, however, is largely ineffective since many underground structures have detours that lead to multiple entry and exit points, making the destruction of them much more complicated. It also doesn't help that the sections which have been demolished by explosives are easily repairable. Another issue surrounding the search and destroy aspect of combating this underground system is that soldiers are often unable to determine whether or not the tunnels are booby trapped.

This type of warfare has been effective for centuries; what ISIS and Hamas is doing is bringing notice to it. In fact, most nations in the Middle East and around the world for that matter already have these underground structures in place and will only be emboldened against stronger nations the longer a small number of militants—relatively speaking--are able to survive by simply building underground fortifications. Israel and the US are working on technology that will allow them to detect underground tunnels, and if they are successful, we may see an end to the prolonged conflict in the Middle East. If not, then we can expect that everyone there will attempt to pursue self determination without regard for another country's superior air power. The technology used to detect underground tunnels involve the use of seismic or gravity detectors. Seismic detectors are able to measure the vibrations as they pass objects beneath the surface of the earth, and if able to find a common anomaly that would identify the existence of a tunnel, those detectors could be effective. However, there would still need to be intelligence that pinpoints the general area of where a tunnel may exist. Gravity detectors like gravimeters are able to detect changes in the Earth's gravitational field based on the density beneath the surface. The presence of a void underground would reduce the

gravitation force and would thus show up accordingly on the gravimeter. Another method is measuring the voltage of an electrical current, which would move at a lower voltage inside a void. Ground Penetrating radar(GPR) is another device used to detect tunnels. GPR uses pulses of radio frequency energy to see underground. The distances detected underground however is limited, since it maxes around a depth of 50 ft. Tunnels have been dug by drug smugglers and militants as far as 100 ft beneath the surface. The use of bunker busters(aerial bombers employed by the US against ISIS) which can penetrate hundreds of feet of both earth and concrete, is still challenged by the possible extensiveness of the tunnels. Some tunnels have multiple detours that allow for escape and reconstruction of damaged sections. Drug smugglers now present a much higher risk in terms national security, since a tunnel system is both a defensive and offensive weapon--irrespective of its use in drug smuggling activities. The arrest of two Houthi militants at the US/Mexican border in 2021 raises the question of vulnerability, since one can posit that infiltration of Latin America by radical militants puts the US at risk of not only the implication of undetected drugs coming into the country, but also the implication surrounding the likelihood of a militant attack or ambush initiated from an underground tunnel originating from Mexico.

The tunnel entries built by Hamas and ISIS are about 1 meter wide and go as deep as 100ft beneath the surface. Pneumatic jackhammers are often used to dig out the tunnels and workers cover about 2-3 meters a day using them. Militants usually employ skilled workers to do the job. These workers normally have some knowledge of the engineering and geological aspects that go into constructing a tunnel. The tunnels are often dug from the inside of a shelter or home, which provides operatives with more stealth. ISIS militants who have escaped enemy fire, often seek refuge in nearby villages and pay residents there to help them construct tunnels.

There are some hazards associated with the initial constructing process, such as cave-ins and collapses. It's common for workers to perish during the excavation process. Collapses usually result from not waiting long enough after a torrential rainstorm to resume tunnel construction. As a result, soil erosion, which often compromises the landscape, puts workers underground at risk of being trapped after the collapse.

Casualties have ironically allowed Hamas to improvise on the underground construction process and gain a greater understanding of it altogether. Hamas has in turn managed to equip their tunnel system with electricity, concrete walls and ceiling, and is able to conduct communications. Hamas has been able to smuggle concrete into Gaza and has used it to fortify their tunnel system. ISIS, on the other hand, has a less featured system, but has learned over the years how to survive direct air assaults by hiding underground. It's likely that ISIS will build their tunnels based on the proximity of gas field locations. Many of the recent ambush attacks by ISIS against Syria have occurred near oil and gas fields. Oil and gas are both important elements of warfare, as they allow militants to maintain electrical, logistical, and communication channels.

Looking at what we've gathered so far in terms of side 1 and side 2 of health, we can begin the process of placing "gravity" itself. With elements like the Sun, and oxygen on side 1, and carbon dioxide on side 2, we can safely place gravity on side 2. Anti-gravity, likewise, would go on side 1. We can also add air power, thrust, propulsion to side 1 since those are anti-gravity concepts. This sinking aspect of gravity as it relates to an object toward the earth affirms its placement with carbon dioxide on side 2 since there is more carbon dioxide underground than above ground. There is also less oxygen underground.

So if we look at the opposing aspect relating to above-ground and underground, we see that the deeper one goes under the surface, the more ineffective all above surface components become as it relates to any influence it could have on subterranean components. This aspect applies both ways. To apply analogously the idea that a component from side 1 or side 2 can eventually overcome and overpower the components of its opposite side, we must presume that more of one or the other would propose a threat to its opposite. More penetration into the earth does not necessarily threaten the components or situation above ground, or vice versa, a higher elevation above the surface doesn't necessarily threaten the underground components.

The biggest threat to any underground structure is heavy rain. In most tunnel collapses, heavy rain is often the main cause. Geologically speaking, rain effects are often deterred by things such as concrete or

mulch which shields the soil from the effects of heavy rain or wind. In tunnel collapses, after the rain water hits the soil, it eventually infiltrates its way to the tunnel's surrounding rock, weakening it though erosion. Water gets into cracks and joints, eventually causing the rocks to break open and split apart. At the moment one can presume that precipitation is perhaps the greatest threat to underground tunnels. This in itself is a form of intelligence since it's likely that, because of this, militants will not shelter or construct underground during days of heavy rain. They may also, as a way to improvise, start constructing tunnel paths directly underneath surface paths formed with concrete or asphault, i. e. city streets. This would lessen the effect of heavy rain on tunnel stability. However, the lack of arable land and prevalence of prolonged droughts in the middle east still allows for uninterrupted construction of sustainable tunnels there. This allows us to comprehend the notion that underground structures would be more operational or populated during seasons of drought as opposed to seasons of precipitation. It's likely that militants in the middle east have already planned in advance for climate factors.

The approach to this field of conflict should be applied with some discrimination since factors like 'what the tunnels are being used for' need to be taken into consideration. Smuggling purposes would not warrant a counter-terrorism search and destroy operation since civilians are often employed and in many cases forced into transporting cargo to and from. If the tunnels are used for both, then it's all the more difficult to discriminate accordingly. Ideas have been presented which propose that soldiers infiltrate on foot into the actual tunnels and conduct operations from there. The challenges to this idea is that signals are often weaker or disabled below the surface, making it difficult to maintain good communications. Another issue is the question of soldiers having the necessary oxygen to carry out prolonged subterranean missions. Beneath the surface, oxygen levels are usually lower, which puts soldiers at risk and endangers the mission. There is also the potential of carbon monoxide poisoning should soldiers be exposed to heavy smoke. Gas mask and other oxygen-storing equipment would be ineffective in protecting personnel against a carbon monoxide build-up within such an enclosed space. Ideally being able to detect and display tunnels on above surface radar makes for a more astute counter tunnel strategy since personnel would be less required to enter the

underground fortification. They can simply wait for operatives to exit the underground structure before apprehending the situation. This makes it easier to discriminate exactly who goes into and out of the tunnels.

While jihadist cross-border tunneling is an issue for Israel's national security, it still ranks below the dangers presented by incoming rocket fire from militants in Gaza. While the Iron Dome is increasingly effective in countering enemy rockets, Israel is still faced with the possibility of high civilian casualties and also the geopolitical implications of defense. The Iron Dome presents a conundrum from a geopolitical perspective. Hamas is able to calculate how firing rockets at civilians--with these rockets being intercepted by the Iron Dome defense——should allow for more justification later on should Israel retaliate and cause Palestinian civilian casualties in the process. The success of the Iron Dome in containing and intercepting incoming rocket fire often de-magnifies militant aggression toward the civilian population. In this case, Israel should get credit for not allowing enemy rockets to kill Israeli civilians, negating a prospect that would conveniently allow for Israel to garner more international support in defense against militants in Gaza. The militants in Gaza are wise in recognizing the need for international sympathy and their calculated strategy has brought forth the necessary aid needed to build up their reserves, and the international support needed to justify their rocket attacks on Israel. The geopolitical aspects are heading in the direction of Israel having to call off any excursions in Gaza territory, while at the same having the burden of defending themselves against rocket attacks, with those terrorist attacks having no implication on the international outlook of militant aggression against Israeli civilians. Under this paradigm, actual terrorism becomes defined when the terrorists are successful. When they are thwarted, the attempted terrorism has no bearing on the perpetrator. This factor puts more pressure on the application of precision and the technology needed to apply it, since Israel will not seek justification by allowing Israelis to be killed by rocket fire. It should be said that allowing attacks against one's own territory and civilians was a tactic commonly used by armed forces throughout history.

The ability to map out on radar the location of all underground structures within a given area is the ideal scenario regarding new technologies. This would allow for personnel to optimally discriminate

who goes into and out of the structures. It would also allow them to plan in advance an effective approach in neutralizing any dangers surrounding the operational intent within the tunnels. This neutralizing aspect may serve as a more ideal approach since the existence of the tunnels may be an asset in the future and simply keeping the tunnels under observation, as opposed to destroying them, can provide an added defense measure in an unfavorable event. The tunnels can also be re-fortified and sustained for later use or as a geological study, saving both time and money.

The above surface structures provide some protection to underground tunnels. Concrete and Asphalt reduce the effects of heavy rain on the soil and averts the possibility of rock erosion beneath the surface, which is normally a factor that causes many underground structures to collapse. This makes concrete the number one area of interest in locating the existence of an underground tunnel. If the workers are apprehending the effects of precipitation, then it's likely that they have improvised by routing tunnels to follow an alignment with the above surface concrete. If that is not the case, then they would have improvised to only construct or inhabit tunnels during dry seasons, and reduce operations there during wet seasons. Gaza militants fortify their tunnels with concrete surroundings, however due to creep (which happens to concrete under sustained load), concrete can easily collapse underground. Heavy soil and rain infiltration into underground rocks cause rocks to break, losing their ability to support the surrounding soil. The wet heavier soil then places more pressure on the underground tunnels, eventually causing them to collapse.

Compared to other places, the Middle East presents less risk of tunnel collapse, due to the prevalence of droughts. Underground tunneling would be much more hazardous in tropical climates where it rains regularly, making the construction of underground tunnels aligned to the above ground concrete much more imperative. A good contingency for urban areas would be the use of rods that penetrate deep into the ground at different intervals in a city through concrete or asphalt surfaces, allowing for possible detection should diggers take into consideration the location of concrete surfaces as they construct a tunnel. Paved roadways in urban areas provide a security aspect for

tunnelers and a security risk for cities, should militants apply this type of warfare.

In referencing the side 1 and 2 of health as it relates to air power and tunnel fortifications, we can ruminate on the propulsion and thrust anti-gravity aspects of side 1 as direct antagonists to pro-gravity underground construction on side 2. In propulsion and thrust, pressure is applied to the surface before it breaks the gravity force. This pressure can be applied to side 2 since it goes with the gravitational force. The after-effects of it should define thrust and propulsion on side 1 since gravity is antagonized upon lift. We see in tunnel collapses how pressure from heavy wet soil and surrounding rock degradation has a primary effect. It's analogous to how symptoms arising from side 2 components are exacerbated by addition of another component of side 2, or vice versa, symptoms associated with side 1 exacerbated by addition of other components on side 1. We see in this case, that destruction against the underground component means the application a similar component setting off a toxic effect. However, the void in a tunnel can be applied to side one since is does contain air, and the gravitational pressure surrounding it-as a component of side 2-can serve as the direct antagonist. If we line up our list it should look like this.

Side 1 of health	Side 2 of health
Air power	Underground structure
Upward effect of Propulsion	Downward Pressure of propulsion
Thrust	Downward pressure of thrust
Anti-gravity	Gravity
flying	digging
void in a tunnel	surrounding soil

One can gather that digging out a tunnel beneath the earth's surface is actually the application of a side 1 component against side 2, since the void created brings in oxygen from above the surface. The tunnel construction itself becomes the result of an action against gravitational forces, especially when excavated horizontally. This would call for certain parts of the excavation process to be on side 1. The greater the void, the more it contributes to the side 1 component of above surface

oxygen. Correspondingly, the gravitational effect from hollow ground is much less than that from very dense ground. The density of the earth antagonizes anti-gravity intentions. The location of someone in a void underground is in a position of antagonism to gravity itself, which is why when soil becomes more dense, the load on the underground tunnel increases, putting it at risk. With this, we can place the void within a tunnel on side 1 and the surrounding soil on side 2. The antagonism to air power is not the tunnel, but the underground soil surrounding the tunnel. We can thus presume that an aerial object would have to contend with a greater degree of gravitational pull when positioned above a more dense part of the earth. There are many myths and legends that speak of aircraft disappearing when navigating through certain locations on earth. Even in this regard, one can hypothesize that the aircraft may have encountered some supernaturally dense terrain that could have theoretically yanked it from the sky or in another aspect, supernaturally hollow terrain that could have propelled the aircraft into outer space. Of course that example is just conjecture on an extreme hypothetical scenario.

The implication of search and destroy, without due discrimination, could undermine any incurred security benefit. The proposal of search, entry, and neutralization becomes a very plausible approach when taking geopolitical issues into account. The importance of discrimination in this type of warfare cannot be understated. In fact, the often irresponsible use of drones by the US in places like Africa and the Middle East has given rise to militant aggression and fostered an international urgency for fair tactics and greater precision. Since most tunnel construction is initiated from the inside of a building as a way to avoid detection, the security apparatus in place can start making efforts to install seismic senors, which senses the ground vibration of the earth. These can be installed at various locations no different than the way traffic lights are set up in urban areas. This works at both the foreign and domestic level. The vibration effect of drilling can be detected by a nearby sensor, alerting authorities of possible tunnel construction in the area. This approach attempts to locate the initial tunnel construction process, which may be more feasible than trying to locate tunnels already built. Since jackhammers are normally used to construct them, detecting the subsequent ground vibrations while honing in on the actual drilling site is easily achieved with today's technology. Without

this aspect accommodated into such a program, a huge void would linger should technology attempt to risk time and money in innovations that may take a while to develop. The added time there would provide opportunity for construction of more underground fortifications, an unfavorable prospect from a national security perspective. Focusing first on detecting ground vibrations from the initial drilling process can prevent the proliferation of underground networks. There is a containment aspect to this strategy that should be considered, even if militants could simply work around it by constructing tunnels from within a tunnel. This argument is supported by the fact that the existence of tunnels in the present tense has not yet reach a tipping point. The security apparatus has enough time to begin the process of prevention, as opposed to elimination of existing tunnel structures. The idea is that employing the use of seismic sensors at various locations to detect ground vibrations that come from drilling holes is much easier than trying to develop technology that would detect and locate already-operational tunnels. While sound barriers could theoretically reduce the noise effect of drilling, it cannot deter the vibration aspect that would arise from it. One has to presume that the ground vibration signal detected from the use of jackhammers can be displayed on a device situated within a certain proximity. Installing this type of technology requires thinking ahead along with application before the fact.

A technology that could possibly help detect operational tunnels would be acoustic sensors, assuming the tunnel is fully operational with no more drilling applied to its development. Footsteps would be the only noise that could give away its location. However, in order for this to be developed, one would have to undertake their own tunnel construction and develop algorithms that account for footstep noises at various depths beneath the surface along with its position in relation to the sensor. The project would involve the construction of multiple tunnels at various depths with the sensors placed at various depths and distances from the footsteps. Each sensor would detect the footstep noise at each depth and distance. Algorithms can then be developed that would identify the footstep noise and account accordingly for the distance/position from the sensor. This would help in the noise discrimination aspect of accurate detection and allow one to locate the exact position of the tunnel. A distance metric should be formulated for real-time application. If multiple sensors are alerted, then the algorithm

and distance metric should allow one to be able to trace the path of the tunnel.

While there are challenges in the use of acoustic sensors to apprehend footstep noises among other noises within a certain environment, the use of acoustic sensors underground would make for an easier discrimination process, presuming that there is less background noise underground. It's possible that this technology can be used in conjunction with seismic sensors.

Personnel breach of a tunnel structure poses significant health hazards. One is the possibility of tunnel collapse under sustained load. Mitigating the chances of being in the tunnel during a collapse would come with keeping a close eye on climate factors like precipitation, which is a primary cause of tunnel collapses. Making it a point to avoid tunnel excursion during times of heavy rainfall increases the likelihood of survival and reduces the risk of collapse while being present in the tunnel. Another issue is the possibility of carbon monoxide poisoning should a fire break out in the tunnel. The protective masks don't protect against smoke. Ethanol vapor inhalation could provide some protection against carbon monoxide exposure. In a study involving rats, ethanol intoxication was found to have a protective effect against carbon monoxide poisoning. This idea can be applied underground if the ethanol, which is a flammable agent, is sealed safely away from any possible contact with incendiary materials or ignition factors. Flammable materials are recommended to be stored in areas where there is strong ventilation. Underground structures, however, usually lack in this regard. The only workaround is for operatives to enter underground tunnels with alcohol in their system. The drawback of this is that the alcohol would contribute to reductions in judgment and reaction time in the event of a serious emergency. This is not the ideal state for anyone to be in during a risky mission, but it's the only way to safely make use of alcohol's protective effect against carbon monoxide poising in a poorly ventilated enclosed space. This also offers the idea that a trade off may be necessary—giving up some reaction time and judgment in exchange for extended time in the tunnels. Certainly during the breaching process, ethanol vapors could be applied to breathing apparatuses. The importance of a workaround is mediated by the fact that personnel would be able to stay underground much longer. If we

revert back to the side 1 and 2 of health(pg 16 & 17 of this appendix), we already see that oxygen and alcohol are placed on the same side, affirming alcohol as a proponent of oxygen and an antagonist against anti-oxygen elements. So it makes sense as to why ethanol, which is the main ingredient in alcohol, would provide protection against carbon monoxide poisoning. Correspondingly, there could other factors on side 1 that may protect a person in low oxygen environments.

Another challenge facing the underground operations is the adequacy of communications equipment. Signals are often lost at very deep locations beneath the surface of the earth. Thick layers of earth embedded between the tunnel and the surface is the major factor in signal blockage. Radio signals have a hard time penetrating those thick layers, which obstruct the necessary communications. In urban environments, radio signals encounter similar obstruction in areas where the receiver is positioned behind or above thick or multiple layers of concrete. In skyscrapers, radio repeaters have to be installed in order for communications to reach personnel located on higher platforms. Signal strengthening is a key element in tunnel communications, however personnel could encounter underground structures or situations where these signal strengtheners won't be handy.

Sound travels through the air, water, and many solid structures. When a person speaks into a walkie-talkie, that sound is converted into radio waves or signal and transmitted with the antenna. A walkie-talkie using the same channel can receive that transmission with their antenna and decode the sound from the signal. In underground situations, the signal transmitted is often blocked by the thick barrier of earth between the tunnel and surface. A creative workaround would be finding a way for the sound to be converted into bass or vibration before it's converted into a radio signal and transmitted via antenna. The hypothesis here is that the signal's penetration power is directly related to the sound's penetration power. An example would be how the bass of music or voice can still be heard behind a thick barrier, even when the sound of the voice or music can no longer be heard. There would have to be a correlation where as the transmitted converted sound portion of the signal could not be detected by the receiver, the converted bass portion could. Just as there is a point where sound cannot be heard beyond a certain amount of thickness of a barrier, correspondingly there must be

a point where the radio signal cannot be received beyond a certain amount of thickness of a barrier. When bass is applied to the sound, the sound itself is decipherable beyond the sound blocking barrier through the vibration caused by the bass. One can presume that this bass vibration converted to radio signal would allow a for a transmission that would allow the receiver to pick up the signal of the bass vibration beyond the limit of the signal of a regular voice sound, just as the bass itself allowed for the sound to be deciphered beyond the limit of where the sound could penetrate.

A number of people have reported positive results using flat antennas in their basement, an area in buildings where reception is a problem for a number of devices. Based on this information, one can presume that mounting increasingly thin antennas on communication devices could have a positive effect on signal detection from underground tunnels. Mounting antennas on a PVC pipe is also a typical method used to boost signal reception. Incorporating these factors into tunnel communication devices could provide some progress toward eventual breakthroughs.

In the present day, the Middle East is perhaps the greatest example of how effective tunnels are against urban defenses. Beginning in late 2013, ISIS was able to lay siege and occupy large swaths of territory in Iraq and Syria before eventual US intervention in Iraq in 2014 and Russian intervention in Syria in 2015. Even after encountering numerous aerial bombardments by US and Russian Air Forces in Iraq and Syria respectively, ISIS has still managed to survive with the use of tunnels, even launching successful ambushes against Syrian regime forces, a midst their dwindling numbers, thus prolonging the conflict and effectuating an urgency for greater battlefield discipline. Many of the armed forces around the world have recognized the threat and began making concessions to deal with the problem. Israel faces the greatest challenge of dealing with the threat of underground operations by enemy forces. Hezbollah and Hamas have both made use of tunnel warfare and at numerous junctures, successfully infiltrated Israeli territory. Israel has bolstered their defense in response and used technology over the years to locate a number of cross border tunnels. The dangers of kidnappings, planting explosives, hostage taking, and all-out sieges are posed by effective use of underground tunnels. In the West, many underground structures have been built, but mostly for drug

smuggling and immigration purposes. There is at least one instance of a tunnel being built for a bank robbery, which ended up failing due to collapse as a result of heavy rainfall. Portions of the tunnel likely aligned with surface terrain comprised of dirt. When it rained, the water penetrated the soil and eroded the surrounding rock of the tunnel, causing it to collapse. It's likely in the future that attack tunnels will be built to align with surface concrete areas to reduce the risk of collapse from heavy rainfall.

The issue of heavy rainfall brings to light the importance of knowing the surface terrain above the tunnel structure. Surface terrain covered in concrete or mulch is at less risk of compromising underground tunnel stability than surface terrain made up of soil or regular dirt. The concrete and mulch limits the level of water that can penetrate the soil and the tunnel's surrounding rock. When overexposed to water, rocks can break and cause tunnel collapse.

We can only assume that many attack tunnels will not be stabilized with rock bolts. Rock bolts are simply long anchor bolts that are drilled into the ceiling of a tunnel in order to bolster stability and prevent collapse from sustained load.

Technology that would allow underground personnel to detect the type of surface terrain aligned directly above their tunnel position could help with safety protocols regarding unstable areas of the tunnel structure. We posit that tunnel areas aligned with soil or dirt terrain would be areas where there is a high risk of collapse. Tunnel areas aligned with surface terrain covered in concrete or asphalt would be at less risk of collapse.

Focus areas should be narrowed down to regions where rainfall is minimal, since less rainfall correlates with less risk of tunnel collapse. Lack of knowledge on this factor could imperil those embarking on tunnel projects in more tropical areas if they haven't improvised and taken into account the importance of tunnel alignment with concrete covered surface terrain on tunnel stability. Yet, it's important to note that concrete does erode, but extremely slowly. It can take hundreds or thousands of years of being exposed to rainfall for it to began showing signs of wear. This may be a reason why Hamas uses cement for their

underground tunnels. However, there is still a chance of collapse if the surrounding rock erosion outside of the underground concrete tunnel increases the overall load on the concrete itself. The increased sustained load increases the amount of creep and compromises the overall stability of the tunnel.

Those seeking to imitate the Middle East or the Mexican border in terms of constructing underground structures must take into account that the lack of rainfall in those areas is a major asset for tunnel construction. Embarking on such an endeavor in tropical areas will require more risk, time, equipment, knowledge, and patience.

The most optimal idea concerning the tracking of tunnels would be if the tunnels can be discerned from satellite imagery or above surface radar. It was mentioned before that the greatest natural enemy against underground tunnels is heavy rain. Upon research, it occurs that the greatest natural exposer of underground tunnels are sinkholes. If there is a way for surveillance to spot the presence of sinkholes on its display apparatus, it could lead to intelligence regarding the location of a tunnel. Sinkholes have exposed the location of numerous underground excavations. The technology used by NASA to foresee sinkholes in advance could correlate into technology used to locate tunnels from observing radar systems. In 2014, NASA used technology that bounced signals off the ground and measured the differences in the phase of the waves returning to the satellite. Ground layer surface deformity moved horizontally toward where the sinkhole eventually formed. As a result, horizontal surface deformations became the key indicator of sinkhole formation, allowing for a possibility that tunnels could be detected remotely.

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